

Press release

BIBKO® INFRA TEC - Process water recycling

Chamber filter press x centrifuge – a comparison

Choosing the right technology can determine the efficiency and cost-effectiveness of a production process. Chamber filter presses and centrifuges are two proven methods for solid-liquid separation in process water recycling - with different approaches. Both methods are compared below.



Chamber filter press

Process water – how it is generated

Process water is produced during the wet mechanical recycling of mineral waste in recycling systems. This waste includes, for example:

- Sewer flushing waste
- Drilling fluid
- Street sweepings

The recycling systems focus in particular on the following points:

- Volume reduction by separating the water content
- Recovery of the minerals (sand) contained as a secondary raw material
- Recovery of the remaining solids in a stable form
- Recovery of the water content through the use of a *chamber filter press* and *centrifuge*

Recycling system

The recycling system is structured as a 4-stage process

Process stage 1: Material feed

Process stage 2: Material recycling

Process stage 3: Fine particle separation

Process stage 4: Process water recycling

- » Process stages 1 and 2 represent the process stages for processing the solids (minerals)
- » Process stages 3 and 4 represent the process stages for processing the process water



Centrifuge - Type Decanter centrifuge

Processing of solids

Process stage 1: Material feed

The material is fed and conveyed from the vehicles into the recycling machine via feed hoppers, dose buffers or feed bunkers.

In contrast to the feed hopper, which requires slow and even material feeding, dosing buffers and feed bunkers enable fast, intermittent emptying of the vehicles. This leads to a reduction in waiting and downtimes.

Processing then takes place continuously in the recycling plant. This ensures a consistently high quality of the recycled material, regardless of the feed quantity and feed speed.

Process stage 2: Material recycling

In the recycling machine, recycling takes place in a wet-mechanical process. A rotating spiral conveys the material through a water bath, separating it in the process. At the same time, water flows through the washing chamber using the counterflow principle.

The washed minerals $>250 \mu\text{m}$ are removed from the washing chamber via a bucket elevator and fed to the spiral conveyor. The material is discharged partially dewatered via this conveyor.



Dose buffer (right) with recycling machine (left)

This process produces the process water described above, which is drained from the recycling machine and fed into an intermediate buffer. This buffer contains an agitator to keep the minerals $\leq 250 \mu\text{m}$ in suspension and thus prevent sedimentation. This intermediate buffer serves as a storage tank for process stages 3 and 4.

Process stage 3: Fine particle separation

In order to further reduce the proportion of minerals $\leq 250 \mu\text{m}$ in the process water, the process water is fed into the fine particle separation stage in the next step. There, the components $>63 \mu\text{m}$ are separated out.



Fine particle separation

This process stage recovers additional minerals on the one hand and reduces the amount of precipitating and flocculating agents required for the treatment and recovery of the water content in process stage 4 on the other hand.



Intermediate buffer with agitator

From the fine particle separation, the remaining process water with minerals $\leq 63 \mu\text{m}$ enters another intermediate buffer with an agitator. From there, it is processed in a chamber filter press or centrifuge.

Process water processing

Chamber filter press

Functional principle

Chamber filter presses consist of a series of filter plates (filter package) that form filter chambers. The process water to be filtered is pumped into these chambers under pressure.

The liquid is pressed through the filter medium (filter cloth). The solids are retained in the chambers and form a filter cake.



Filter plates with filter cloth – Plate package open

Design

The main components of the chamber filter press are the filter plates, filter cloths, a hydraulic or mechanical closing system, and supply and discharge lines for process water (input) and filtrate (output). The plates are suspended from a frame and pressed together during the filtration process.

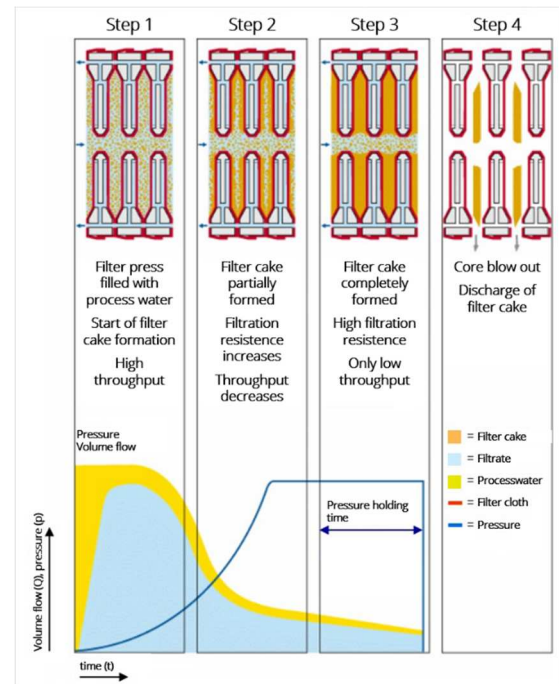
How it works

The filtration cycle includes filling the chambers under pressure, the actual filtration, possibly post-pressing or cake washing, opening the press, and finally removing the cake. The process is discontinuous (batch operation).



Chamber filter press – mounted in container (mobile)

The filtration cycle is shown below.



Filtration cycle chamber filter press

Properties

Depending on the material, chamber filter presses achieve a dry matter content in the filter cake of 25-35%. Chamber filter presses enable effective separation even with difficult products and have relatively low operating costs.

Special design: Membrane filter press

The membrane filter press is a further development of the chamber filter press. While the filter plates in the chamber filter press are rigid and the filter cake is compacted only by the pump pressure, the membrane filter press also has flexible membranes integrated. These can be inflated with compressed air, water, or hydraulically after the press has been filled, and they additionally compress the filter cake mechanically. This can increase the dry matter content in the filter cake by a further 5-15%.

Centrifuge

Functional principle

Centrifuges use the centrifugal force generated by rapid rotation. This force is many times stronger than the force of gravity and separates substances with different densities.



Centrifuge - Type Decanter centrifuge

Design

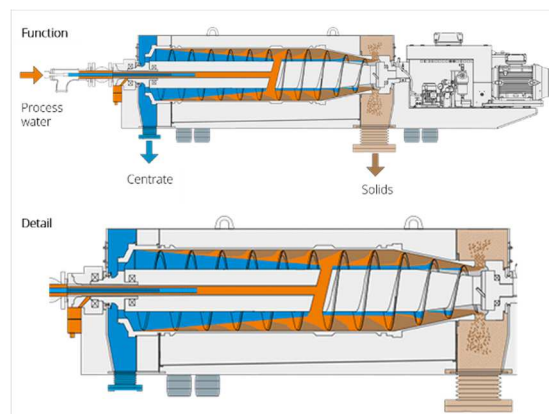
The main components of the centrifuge are a rapidly rotating drum and a screw conveyor. The rapidly rotating drum generates the centrifugal force required for separation. This causes heavy particles to be deposited on the drum wall. These are discharged via the screw conveyor. The clarified process water is drained off.

How it works

In centrifuges, the feed of the process water, the separation, and the discharge of the solids take place simultaneously during operation. The rotor rotates continuously at operating speed. The material flows through the machine continuously. This makes the separation process a continuous process.

Properties

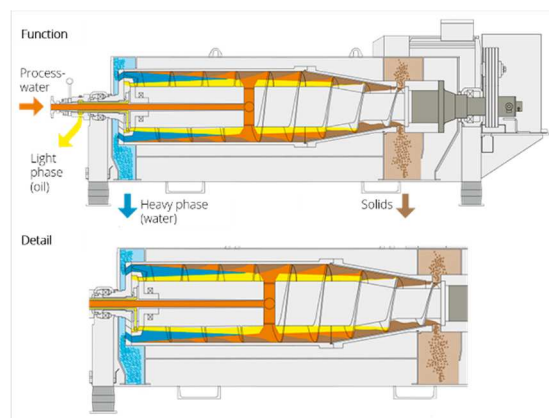
The most important feature of the centrifuge is its continuous operation without downtime for emptying. This enables high throughputs and easy process integration. Depending on the material, centrifuges achieve a dry matter content in the solids of 15-35%.



Separation process centrifuge – Type Decanter centrifuge

Special design: TricaPress

Unlike conventional (decanter) centrifuges, the TricaPress centrifuge can separate two immiscible liquids of different densities (oil/ water) and a solid phase in a single process step. Centrifugal force ensures separation, with the heavier liquid settling in the middle between the lighter liquid and the solids. All three phases can then be discharged separately from the centrifuge.



Separation process centrifuge - Type TricaPress

Summary

Chamber filter press x centrifuge

Both chamber filter presses and centrifuges are used for solid-liquid separation. However, their properties differ. The most important ones are compared again below:

Chamber filter press

- High filtrate quality

- Discontinuous batch operation
- Less flexible with fluctuating feed quality
- Lower energy consumption, but more personnel required (emptying, cloth cleaning – automatic versions available)
- Dry solids (filter cake)

Centrifuge

- Good filtrate quality
- Continuous operation
- Flexible and immediate response to fluctuating feed quality
- Higher energy consumption, but lower personnel costs
- Moist solids

Both chamber filter presses and centrifuges are used successfully and beneficially in the following projects, for example:

Project 1

Location	Leer (DE)
Material	Drilling fluid
Process	Centrifuge

Project 2

Location	Neuenhagen (DE)
Material	Sewer flushing waste Drilling fluid Leftover ready mix Sand trap material
Process	Chamber filter press (Type Membrane filter press)

Recovery of water content: Why?

The recovery of the water content was initially described as one of the objectives of using a recycling system. Why is this recovery so important? There are two main reasons for this:

- Solids: The more dewatered the solids are (= high dry matter content), the lower the quantities to be disposed of and thus the costs for disposal.

- Filtrate/ Centrate: Due to the good quality of the separated water, it can be used for the recycling process (process stage 2: recycling process) and for rinsing the vehicles. This significantly reduces the demand for fresh water and thus the costs for fresh water.

If excess water is produced, it can be discharged either directly or indirectly.



Output volume flows

The selection of the appropriate method is based on the project-specific conditions.

Further information

The following QR-code will take you to the **BIBKO® INFRA TEC** - YouTube channel.

